The Role of Suborbital Research in Addressing NASA's Mandate in Atmospheric Composition

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The concern over halogen-catalyzed destruction of ozone (raised by the work of Cicerone and Stolarski and of Molina and Rowland) initiated international focus on stratospheric photochemistry and kinetics. In June 1975, the US Congress passed legislation directing NASA "To conduct a comprehensive program of research, technology and monitoring of the phenomena of the upper atmosphere." This language in NASA's FY1976 authorization bill, gave the Agency a clear mandate to perform research concerned with depletion of the ozone layer, and NASA's Upper Atmosphere Research Program was born. This mandate was further amplified through the Clean Air Act Amendments of 1990, which directed NASA and NOAA to "monitor stratospheric ozone and ozone depleting substances and submit a report to Congress on the current average tropospheric concentration of chlorine and bromine and on the level of stratospheric ozone depletion." Addressing this mandate has required a full complement of measurements in the troposphere and stratosphere conducted from the ground, balloons, aircraft, and satellites. This talk will focus on the use of suborbital capabilities for investigating the seasonal behavior of stratospheric ozone production and loss from pole to pole. Highlights of several airborne campaigns will be presented, as will the role of ground-based networks for tracking the lifecycle of ozone-related and climate-related trace gases in the atmosphere. This research has provided critical input to the original Montreal Protocol on Substances that Deplete the Ozone Layer as well as its Amendments and Adjustments.